PTO 01-[PTO # 2005-2056]

Japanese Patent

Document No. H11-239356

BLACK AND WHITE COLOR SWITCHING CAMERA

[白黒ハラー切機カメラ]

UNITED STATES PATENT AND TRADEMARK OFFICE

Washington, D.C. February 10, 2005

Translated by: Schreiber Translations, Inc.

Country	:	Japan
Document No.	:	11-239356
Document Type	:	Kokai
Language	:	Japanese
Inventor	:	**KATSUJI HASE**
Applicant	:	Sanyo Electric KK
IPC	:	H04N 9/04
Application Date	:	February 24, 1998
Publication Date	:	August 31, 1999
Foreign Language Title	:	白黒ハラー切機カメラ
English Title	:	**BLACK AND WHITE COLOR SWITCHING CAMERA**

(19) JAPANESE PATENT OFFICE (JP)

(11) Unexamined Patent Application (Kokai) Patent H11-239356

(12) Official Gazette for Kokai Patent Applications (A)

(43) Publication Date: August 31, 1999

(51) Int. Cl.[8]	Classification	FI	
H04N 9/04		H04N	B
5/225		9/04	C
5/238		5/225	Z
		5/238	

Request for Examination: Not yet examined Number of claims: 4 (Total of 8 pages)

(21) Application No.: H10-41980

(22) Filing Date: February 24, 1998

(71) Applicant 000001889

Sanyo Electric KK

2-5-5 Keihan-Hondori Moriguchi City Osaka

(72) Inventor: **KATSUJI HASE**

Sanyo Electric KK

2-5-5 Keihan-Hondori Moriguchi City Osaka

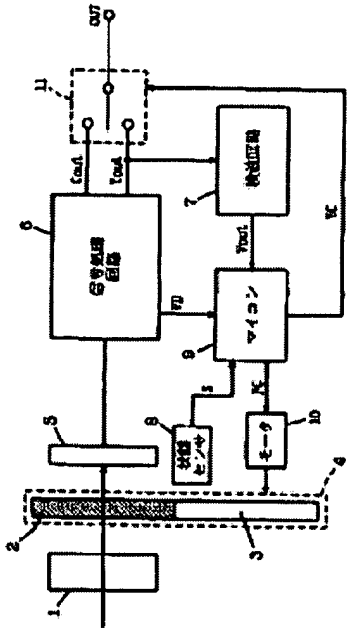
(74) Representative Patent Attorney Hisao Fukami (3 others)

(54) [Title of the Invention] BLACK AND WHITE COLOR SWITCHING CAMERA

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a camera that automatically selects a color video image or a black/white video image in response to exterior light.

SOLUTION: A camera is equipped with a microcomputer 9 that compares an integrated value from a detection circuit 7 with a prescribed threshold and provides an output of a filter switching signal and a black and white/color switching signal depending on the result, a motor 10 that receives the filter switching signal and inserts/removes an IR cut filter 2 or a dummy glass 3 between a lens 1 and a CCD 5, and a changeover switch 11 that receives the black and white/color switching signal, through which a color signal or a black/white signal is applied to an output terminal OUT of the camera.



[Claim(s)]

[Claim 1] A black and white color switching camera wherein an image sensor, an infrared cut filter, and a signal-processing means to generate a monochrome signal and a color signal according to the signal from said image sensor. When the exterior brightness is brighter than the predetermined brightness, said infrared cut filter is inserted into the light acceptance side of said image sensor and the filter means for switching which samples said infrared cut filter from the light acceptance side of said image sensor when the brightness of said exterior is darker than predetermined brightness and wherein the color

signal generated with said signal-processing means, when the brightness of said exterior is brighter than said predetermined brightness, is chosen and outputted and a black and white / color change-over camera equipped with the signal means for switching, which chooses and outputs the monochrome signal generated with said signal-processing means, when the brightness of said exterior is darker than said predetermined brightness.

[Claim 2] A black and white color switching camera wherein there is received the monochrome signal generated with said signal-processing means, and when said monochrome signal is larger than a predetermined threshold, the 1st filter change-over signal, and the 1st black and white / color change-over signal are outputted and having further a discriminating means to output the 2nd filter change-over signal, and there is a 2nd black and white / color change-over signal, when said monochrome signal is smaller than a predetermined threshold with said filter means for switching, when said 1st filter change-over signal is received, and said infrared cut filter is inserted in the light acceptance side of said image sensor and when said 2nd filter change-over signal is received, said infrared cut filter is sampled from the light acceptance side of

said image sensor and with said signal means for switching the black and white / color change-over camera according to claim 1, which selects and outputs the color signal generated with said signal-processing means when said 1st black and white / color change-over signal is received, and selects and outputs the monochrome signal generated with said signal-processing means, when said the 2nd black and white / color change-over signal is received.

[Claim 3] A luminance detection means to detect the brightness of said exterior and to output an luminance signal, and said luminance signal is received and when said luminance signal is larger than a predetermined threshold, the 1st filter change-over signal, and the 1st black and white / color change-over signal are outputted. It has further a discriminating means to output the 2nd filter change-over signal and the 2nd black and white / color change-over signal, when said luminance signal is smaller than a predetermined threshold and said filter means for switching, when said 1st filter change-over signal is received, triggers said infrared cut filter to be inserted in the light acceptance side of said image sensor. When said 2nd filter change-over signal is received, said infrared cut filter is sampled from the light acceptance

side of said image sensor and said signal means for switching and with a black and white / color change-over camera, according to claim 1, which chooses and outputs the color signal generated with said signal-processing means, when said 1st black and white / color change-over signal is received, and there is selection and output of the monochrome signal generated with said signal-processing means when said the 2nd black and white / color change-over signal is received.

[Claim 4] A black and white / color change-over camera as in either of claims 1 to 3 wherein there is sampling from said clear glass from the light acceptance side of said image sensor by having further equally clear glass of said infrared cut filter and optical path length when said filter means for switching inserts said clear glass in the light acceptance side of said image sensor when said infrared cut filter is sampled from the light acceptance side of said image sensor, and said infrared cut filter is inserted into the light acceptance side of said image sensor.

[Detailed Explanation of the Invention]

[0001]

[Field of the Invention] This invention relates to a black and white / color change-over camera which has an image sensor.

[0002]

[Description of the Prior Art] With many color cameras, a CCD is used as an image sensor. The sensitivity of the CCDs reaches a wavelength of 400nm ~ 900nm, and especially, the sensitivity of an infrared region (700nm or more) is high. If the incidence of the light from a photographic subject is carried to such a CCD unaltered, there would be inserted an IR cut filter (infrared cut filter) between the lens and the light sensing portion of CCD, and the color reproduced will have removed the light of the wavelength component of an infrared region. Accordingly, the color image by CCD has color reproduction comparable as that of human eyes.

[0003] With such a color camera, as with daylight, when the exterior is bright, a possibly good color separation is acquired, but at night, when the exterior is dark, a good color image as with daylight is not acquired. This is because the light irradiated by the light sensing portion

of CCD is restricted to the light of the wavelength component of light (about 400-700nm) restricted by IR cut filter.

[0004] On the other hand, with a monochrome camera which uses CCD, since a IR cut filter is not used, the image contains the wavelength component of an infrared region, and an image is acquired also under the low luminance of night. For this reason, it is used as a surveillance camera at night for crime prevention.

[0005]

[Problem(s) to be Solved by the Invention] Although the desired image to be acquired is the usual color image which can distinguish colors in daytime, and to be used under a low luminance as a surveillance camera for crime prevention at night, one camera was not able to perform both functions.

[0006] As a means for solving the problem, in Patent H6-292213 (A), although the video camera can acquire alternatively a special image by R, G, and IR and the usual color image with a B cut filter and an infrared cut filter, switching the two filters is cumbersome.

[0007] This invention was constructed to solve the above technical problems, and even if dark [in the exterior] or bright, the camera can acquire a clear image.

[0008] The further purpose of this invention is to offer a camera which can switch a color image and monochrome image automatically according to exterior brightness.

[0009]

[Means for Solving the Problem] According to this invention, a black and white / color change-over camera will be equipped with an image sensor, an infrared cut filter, a signal-processing means, a filter means for switching, and a signal means for switching. A signal-processing means generates a monochrome signal and a color signal according to the signal from an image sensor. When the exterior brightness is brighter than the predetermined brightness, an infrared cut filter is inserted in the light acceptance side of an image sensor, and when exterior brightness is darker than the predetermined brightness, an infrared cut filter is sampled from the light acceptance side of an image sensor. When the exterior brightness of a signal means for switching is darker than predetermined brightness, the infrared cut filter is extracted. For the signal switching means, when the exterior brightness is brighter than the predetermined brightness, the color signal that

was generated by the signal processing means is selected and output, and when the exterior brightness is darker than the predetermined brightness, there is output by selecting the black/white signal which was generated by the signal processing means.

[0010] In the above-mentioned black and white / color change-over camera, when the exterior brightness is brighter than the predetermined brightness, an infrared cut filter is inserted in the light acceptance side of an image sensor. The light from which the wavelength component of an infrared region was removed by this filter is irradiated to the light sensing portion of an image sensor, and the color signal generated with a signal-processing means becomes a good color reproduction, excluding the component of the infrared region. This color signal is output to the exterior by selecting the signal switching means.

[0011] On the other hand, when the exterior brightness is darker than the predetermined brightness, an infrared cut filter is withdrawn from the light acceptance side of an image sensor. Thereby, the light also containing the wavelength component of an infrared region is irradiated to the light sensing portion of an image sensor, and the monochrome signal generated with a signal-processing means

contains the wavelength component of an infrared region. This monochrome signal is output to the exterior by selecting the signal switching means.

[0012] Preferably, the above-mentioned black and white / color change-over camera receives as input the monochrome signal generated with a signal-processing means, and when the monochrome signal is larger than a predetermined threshold, the 1st filter change-over signal, and the 1st black and white / color change-over signal are output, and when the monochrome signal is smaller than a predetermined threshold,

There is provided as discriminating means to output the 2nd filter change-over signal, and the 2nd black and white / color change-over signal.

The above-mentioned filter means for switching inserts an infrared cut filter in the light acceptance side of an image sensor, and when the 1st filter change-over signal is received, and when the 2nd filter change-over signal is received, infrared cut filter is withdrawn from the light acceptance side of an image sensor. The above-mentioned signal means for switching outputs by selecting the color

signal generated with a signal-processing means, and when the 1st black and white / color change-over signal is received, and when the 2nd black and white / color change-over signal is received, there is output by selecting the monochrome signal that was generated by the signal processing means.

[0013] In the black and white / color change-over camera constituted as mentioned above, the level of the monochrome signal generated with a signal-processing means is changed according to the exterior brightness. A discriminating means detects the level of this monochrome signal, and compares it with a predetermined threshold. Consequently, when the level of a monochrome signal is larger than a predetermined threshold, the 1st filter change-over signal is sent to a filter means for switching from a discriminating means, and the 1st black and white / color change-over signal is sent to a signal means for switching from a discriminating. In response to these signals, a filter means for switching inserts an infrared cut filter in the light acceptance side of an image sensor, and a signal means for switching selects the color signal generated by the signal-processing means, and outputs it to the exterior.

[0014] When the level of a monochrome signal is smaller than a predetermined threshold, the 2nd filter change-over signal is sent to a filter means for switching from a discriminating means, and the 2nd black and white / color change-over signal is sent to a signal means for switching from a discriminating means. In response to these signals, a filter means for switching withdraws an infrared cut filter from the light acceptance side of an image sensor, and a signal means for switching chooses the monochrome signal generated with a signal-processing means, and outputs it to the exterior.

[0015] Preferably, the above-mentioned black and white / color change-over camera is further equipped with an luminance detection means and a discriminating means. A luminance detection means detects exterior brightness and outputs a luminance signal. A discriminating means receives a luminance signal, when the luminance signal is larger than a predetermined threshold, the 1st filter change-over signal, and the 1st black and white / color change-over signal are output, and when the luminance signal is smaller than a predetermined threshold, the 2nd filter change-over signal, and the 2nd black and white / color change-over signal are output. Moreover, the above-mentioned filter

means for switching inserts an infrared cut filter in the light acceptance side of an image sensor, and when the 1st filter change-over signal is received, and when the 2nd filter change-over signal is received, an infrared cut filter is withdrawn from the light acceptance side of an image sensor. Moreover, a signal means for switching selects and outputs the color signal generated with a signal-processing means, when the 1st black and white / color change-over signal is received, and when the 2nd black and white / color change-over signal is received, it selects and outputs the monochrome signal generated with a signal-processing means.

[0016] In the black and white / color change-over camera constituted as mentioned above, the level of the luminance signal generated with a luminance detection means is changed according to exterior brightness. A discriminating means detects the level of this luminance signal, and compares it with a predetermined threshold. Consequently, when the level of an luminance signal is larger than a predetermined threshold, the 1st filter change-over signal is sent to a filter means for switching from a discriminating means, and the 1st black and white / color change-over signal is sent to a signal means for switching from a discriminating means. In response to these signals,

a filter means for switching inserts an infrared cut filter in the light acceptance side of an image sensor, and a signal means for switching chooses the color signal generated with a signal-processing means, and outputs it to the exterior.

[0017] When the level of a luminance signal is smaller than a predetermined threshold, the 2nd filter change-over signal is sent to a filter means for switching from a discriminating means, and the 2nd black and white / color change-over signal is sent to a signal means for switching from a discriminating means. In response to these signals, a filter means for switching withdraws an infrared cut filter from the light acceptance side of an image sensor, and a signal means for switching chooses the monochrome signal generated with a signal-processing means, and outputs it to the exterior.

[0018] Preferably, the above-mentioned black and white / color change-over camera is further equipped with transparent glass equal to the infrared cut filter and the optical path length. When the filter switching means withdraws the infrared cut filter from the light receiving side of an image sensor, transparent glass is inserted in the light receiving side of the image sensor, and when the infrared filter is inserted on the light receiving side of

the image sensor, the transparent glass is withdrawn from the light receiving side of the image sensor.

[0019] In the above-mentioned black and white / color change-over camera, the optical distance to the light sensing portion of an image sensor does not change during the time of infrared cut filter insertion and clear glass insertion.

[0020]

[Embodiment of the Invention] Hereafter, an embodiment of this invention is explained in detail with reference to the figures. In addition, the same symbols are used in whole or part among the drawings so that explanations are not repeated.

[0021] [Embodiment 1] Figure 1 is the block diagram showing the black and white / whole color change-over camera configuration by embodiment 1 of an implementation of this invention. With reference to Figure 1 , this black and white / color change-over camera is equipped with a lens 1, the IR cut filter 2, dummy glass 3, a sliding mechanism 4, CCD5, a signal processing circuit 6, a detector circuit 7, a conditions sensor 8, a microcomputer 9, a motor 10, and a change-over switch 11.

[0022] The IR cut filter removes the infrared wavelength

component (about 700nm or more) of the light which enters through a lens 1. Dummy glass 3 consists of clear glass, and has an optical path length equal to the IR cut filter 2. A sliding mechanism 4 is driven by the motor 10, inserts either the IR cut filter 2 or dummy glass 3 between a lens 1 and CCD5, and samples another side from between a lens 1 and CCD5. CCD5 changes into an electrical signal the light irradiated by the light sensing portion through the IR cut filter 2 or dummy glass 3. A signal processing circuit 6 generates a color signal (composite video signal) C_{out} and a monochrome signal (luminance signal) Y_{out} in response to the electrical signal from CCD5. A detector circuit 7 integrates the value of the monochrome signal Y_{out} generated by the signal processing circuit 6, and outputs the integral value V_{out}. The condition sensor 8 outputs the condition signal S of L (logic low) level, when the IR cut filter 2 is inserted between a lens 1 and CCD5, and when dummy glass 3 is inserted between a lens 1 and CCD5, it outputs the condition signal S of H (logic yes) level. If the vertical synchronizing signal VD is inputted from a signal processing circuit 6, a microcomputer 9 incorporates the value of the integral value V_{out} from the condition signal S and detector circuit 7 from the condition sensor 8, and the threshold V0 and the integral value V_{out}, which were

set up beforehand, are compared. When the integral value V_{out} is larger than a threshold V0 and the integral value V0 of H level is smaller than threshold V_{out}, the filter change-over signal FC of L level, and the black and white / color change-over signal YC are output. When the filter change-over signal FC of H level is received, a motor 10 drives a sliding mechanism 4 and dummy glass 3 is withdrawn from between lens 1 and CCD5. When the IR cut filter 2 is inserted between a lens 1 and CCD5 and the filter change-over signal FC of L level is received, a sliding mechanism 4 operates, the IR cut filter 2 is withdrawn from between lens 1 and CCD5, and dummy glass 3 is inserted between lens 1 and CCD5. A change-over switch 11, when the H level monochrome color switching signal YC is received, outputs the monochrome signal Y_{out} generated by the signal processing circuit 6 from the output terminal OUT of a camera, and when the L level monochrome color switching signal YC is received, there is output from the output terminal OUT of the camera of the monochrome signal Y_{out} that was generated by the signal processing circuit 6.

[0023] Next, operation of the black and white / color change-over camera constituted as mentioned above is explained.

[0024] The light which enters through the lens 1 is irradiated by the light sensing portion of CCD5 through the IR cut filter 2 or dummy glass 3.

[0025] When the IR cut filter 2 is inserted between a lens 1 and CCD5, light whose infrared wavelength component was removed (about 700nm or more), by the light sensing portion of CCD5, is irradiated by the light sensing portion of CCD5. Since the sensitivity of CCD5 is about 400-900nm, light with a 400-700nm wavelength component almost comparable to a human's relative luminous efficiency, is changed into an electrical signal by CCD5.

[0026] When dummy glass 3 is inserted between a lens 1 and CCD5, the light which entered through the lens 1 is irradiated unaltered by the light sensing portion of CCD5. Therefore, light with a 400-900nm wavelength component, but also containing a wavelength component of the infrared region is changed into an electrical signal by CCD5.

[0027] In response to this electrical signal, color signal C_{out} and a monochrome signal Y_{out} are generated in a signal processing circuit 6. The value of this monochrome signal Y_{out} is changed corresponding to exterior brightness. Therefore, in embodiment 1 there is integration with the value of the monochrome signal Y_{out} for one screen in a detector circuit 7, and this integrated value V_{out} is used

as an index showing exterior brightness. The integrated value V_{out} is compared with the threshold V0 set up beforehand in a microcomputer 9, and based on the comparison, processing for making the output of a camera into color or black and white is performed.

[0028] Hereafter, processing of a microcomputer 9 is explained. Figure 2 is a flow chart which shows the procedure of the microcomputer 9 shown in Figure 1. With reference to Figure 2, the vertical synchronizing signal VD is first input into a microcomputer 9 from a signal processing circuit 6 in step S1.

[0029] Then, in step S2, the integrated value V_{out} from a detector circuit 7 is incorporated. Then, in step S3, comparison with the integrated value V_{out} and a threshold V0 is performed. Hereafter, there are explanations for when the integrated value V_{out} is larger than a threshold V0, and when small.

[0030] (a) If $V_{out} > V0$

This case corresponds to when the exterior brightness is brighter than the predetermined brightness, and the following processes are performed in order to set the color signal C_{out} to the video signal output from a camera.

[0031] First, in step S4, the condition signal S from the

condition sensor 8 is incorporated. When the condition signal S is L level, the IR cut filter 2 is inserted between a lens 1 and CCD5, and because the color signal C_{out} is in an output condition from the output terminal OUT of a camera, and in proceeding to step 8, computer processing is complete. [0032] When the condition signal S is H level, the dummy glass 3 was inserted between a lens 1 and CCD5, and since the monochrome signal Y_{out} is output from the output terminal OUT of a camera, proceed to step S5.

[0033] Then, in step S5, the filter change-over signal FC of H level is output to a motor 10, and the black and white / color change-over signal YC of H level is output to a change-over switch 11. The motor 10, which received the filter change-over signal FC of H level, drives a sliding mechanism 4, withdraws dummy glass 3 from between a lens 1 and CCD5, and inserts the IR cut filter 2. Moreover, the change-over switch 11, which received the black and white / color change-over signal YC of H level connects to the color signal C_{out} side the output terminal OUT which is connected to the monochrome signal Y_{out} side. Consequently, color signal C_{out} will be output from the output terminal OUT of a camera.

[0034] Then, proceed to step S8 and microcomputer processing is completed.

(b) Vout<V0

This case corresponds to when the exterior brightness is darker than the predetermined brightness, and the following processes are made in order to make the monochrome signal Y_{out} as the camera's video signal output.

[0035] First, in step S6, the condition signal S from the condition sensor 8 is incorporated. When the condition signal S is H level, the dummy glass 3 is inserted between a lens 1 and CCD5, and from the output terminal OUT of a camera, the monochrome signal Y_{out} is output, and in proceeding to step S8, microcomputer processing is completed.

[0036] When the condition signal S is L level, the IR cut filter 2 was inserted between a lens 1 and CCD5, and since the color signal Cout is output from the output terminal OUT of a camera, proceed to step S7.

[0037] In step S7, the filter change-over signal FC of L level is output to a motor 10, and the black and white / color change-over signal YC of L level is output to a change-over switch 11.

[0038] The motor 10, which received the filter change-over

signal FC of L level, drives a sliding mechanism 4, withdraws the IR cut filter 2 from between a lens 1 and CCD5, and inserts the dummy glass 3.

[0039] Moreover, the change-over switch 11 which received black and white / color change-over signal of L level connects to the monochrome signal Y_{out} side the output terminal OUT connected to the color signal C_{out} side. Consequently, a monochrome signal Y_{out} will be output from the output terminal OUT of a camera.

[0040] Then, proceed to step S8 and microcomputer processing is completed. According to embodiment 1, as mentioned above, by forming a detector circuit 7, a microcomputer 9, a motor 10, and a change-over switch 11, when the integrated value V_{out} from a detector circuit 7 is larger than the predetermined threshold V0, the IR cut filter 2 is inserted between a lens 1 and CCD5, and color signal C_{out} is output from the output terminal OUT of a camera. When the integrated value V_{out} from a detector circuit 7 is smaller than the predetermined threshold V0, dummy glass 3 is inserted between a lens 1 and CCD5, and a monochrome signal Y_{out} is output from the output terminal OUT of a camera. Consequently, the camera which switches a color image and monochrome image automatically, according to exterior brightness, can be offered. Moreover, since it

is not necessary to use a photometry sensor etc. specially in order to detect exterior brightness with the level of a monochrome signal Y_{out}, an easy configuration is realizable.

[0041] [Embodiment 2] Figure 3 is a block diagram showing black and white / whole color change-over camera configuration by the embodiment 2 of this invention. With reference to Figure 3, this black and white / color change-over camera is equipped with the luminance sensor 12 instead of the detector circuit 7 shown in Figure 1.

[0042] The luminance sensor 12 detects exterior brightness and outputs the luminance signal Vs according to brightness.

[0043] With embodiment 2, the luminance signal Vs is compared with the threshold V0 set up beforehand in a microcomputer 9, and processing for making the output of a camera into a color signal or a monochrome signal according to that result is performed.

[0044] Hereafter, processing of a microcomputer 9 is explained. Figure 4 is a flow chart which shows the procedure of the microcomputer 9 shown in Figure 3. With reference to Figure 4, the vertical synchronizing signal VD is first input into a microcomputer 9 from a signal processing circuit 6 in step S11.

[0045] Then, in step S12, the luminance signal Vs from the luminance sensor 12 is incorporated.

[0046] Then, in step S13, comparison with the luminance signal Vs and a threshold V0 is performed.

[0047] When the luminance signal Vs is larger than a threshold V0, in order to establish color signal C_{out}, the video signal output from a camera, step S4 shown in Figure 2 and steps S14, S15, and S18 and the same processing S5 and S8 are carried out.

[0048] When the luminance signal Vs is smaller than a threshold V0, in order to make a monochrome signal Y_{out}, the video signal output from a camera, the same processing as in steps S6, S7, and S8 shown in Figure 2 and in steps S16, S17, and S18 is made.

[0049] According to the embodiment 2, as mentioned above, by forming a microcomputer 9, a motor 10, the change-over switch 11, and the luminance sensor 12 When the luminance signal Vs from the luminance sensor 12 is larger than the predetermined threshold V0, the IR cut filter 2 is inserted between a lens 1 and CCD5, and the color signal C_{out} is output from the output terminal OUT of a camera. When the luminance signal Vs from the luminance sensor 12 is smaller than the predetermined threshold V0, dummy glass 3 is inserted between a lens 1 and CCD5, and a monochrome signal Y_{out} is output from the output terminal OUT of a camera. Consequently, a camera, which switches a color image and

monochrome image automatically, according to exterior brightness, can be offered.

[0050] In addition, although the microcomputer 9 has detected the direct luminance signal Vs, the integrating circuit which integrates with the luminance signal Vs is established, and it is permissible that a microcomputer 9 detect the output of this integrating circuit with embodiment 2.

[0051] Moreover, although processing with a microcomputer 9 is performed for the vertical synchronizing signal every time with embodiments 1 and 2, it is permissible to perform every 5 or 10 times.

[0052] Moreover, although the insertion point of the IR cut filter 2 and dummy glass 3 is made between a lens 1 and CCD5, the insertion may be before a lens as long as the point is the light acceptance side of CCD5.

[0053] Moreover, if it is a camera using an image sensor like CCD, the camera can be a surveillance camera, a video camera, a digital still camera, etc.

[0054] Moreover, although the embodiments use one threshold V0, when the integrated value V_{out} or the luminance signal Vs becomes large gradually and the threshold of the larger one is attained, using two mutually different thresholds, instead of the dummy glass 3, the IR cut filter 2 is

inserted. When the integral value V_{out} or the luminance signal Vs becomes small gradually and the threshold of the lower one is reached, instead of the IR cut filter 2, the dummy glass 3 is inserted. That is, it is permissible to propose a hysteresis characteristic. In this case, even if the exterior brightness is near a threshold, and there was no exchange of the IR cut filter 2 and dummy glass 3, normally a stable image is obtained.

[0055] The embodiment that was disclosed this time has shown all points and must be thought of as harboring no restrictions.

The range of this invention is shown not by the above-mentioned explanation but by the claims, and it is meant that all modifications in the claims, any equal semantics, and all changes within the claims are included.

[0056]

[Effect of the Invention] The black and white / color change-over camera according to this invention provides a filter means for switching which inserts an infrared cut filter in the light acceptance side of an image sensor when the exterior brightness is brighter than the predetermined brightness, and withdraws an infrared cut filter from the light acceptance side of an image sensor when exterior

brightness is darker than the predetermined brightness, and a color signal generated with a signal-processing means when exterior brightness is brighter than predetermined brightness is chosen and output. When the exterior brightness is darker than the predetermined brightness, the signal means for switching which chooses and outputs the monochrome signal is generated with a signal-processing means, and when the exterior brightness is darker than the predetermined brightness, the color camera with which the usual color image which can also distinguish a color when the exterior brightness is brighter than predetermined brightness (for example, daytime) is acquired (for example, night), can function as a monochrome camera of high sensitivity under low luminance.

[0057] Moreover, when the monochrome signal generated with a signal-processing means is larger than a predetermined threshold, the 1st filter change-over signal, and the 1st black and white / color change-over signal are output, and since it has a discriminating means to output the 2nd filter change-over signal, and the 2nd black and white / color change-over signal, when a monochrome signal is smaller than a predetermined threshold, a change-over of a color image / monochrome image can be automatically performed, according to exterior brightness.

[0058] Moreover, in order to make an index showing exterior brightness level of the monochrome signal generated with a signal-processing means, it is not necessary to specially establish a photometry means.

[0059] Moreover, acting as luminance detection means to detect exterior brightness and to output an luminance signal, when a luminance signal is larger than a predetermined threshold, the 1st filter change-over signal, and the 1st black and white / color change-over signal are output. Since it has a discriminating means to output the 2nd filter change-over signal, and the 2nd black and white / color change-over signal when an luminance signal is smaller than a predetermined threshold, a change-over of a color image / monochrome image can be automatically performed, according to exterior brightness.

[0060] Moreover, with an infrared cut filter and transparent glass of equal optical path length, because there is a switching means so that when the infrared cut filter is withdrawn from the image sensor, the transparent glass is inserted to the receiving side of the image sensor, and when the infrared cut filter is inserted to the receiving side of the image sensor, the transparent glass is withdrawn from the receiving side of the image sensor, the focus of the optical image which produces an image on

the acceptance surface of the image sensor regardless of whether the infrared cut filter has been inserted can be maintained as fixed.

[Brief Description of the Drawings]

[Figure 1] It is the block diagram showing black and white / color change-over camera entire configuration for embodiment 1 of this invention.

[Figure 2] It is the flow chart which shows operation of the microcomputer shown in Figure 1.

[Figure 3] It is the block diagram showing black and white / color change-over camera entire configuration for embodiment 1 of this invention.

[Figure 4] It is the flow chart which shows operation of the microcomputer shown in Figure 3.

[Description of the Symbols]

2 IR Cut Filter

3 Dummy Glass

4 Sliding Mechanism

5 CCD

6 Signal Processing Circuit

9 Microcomputer

10 Motor

11 Change-over Switch

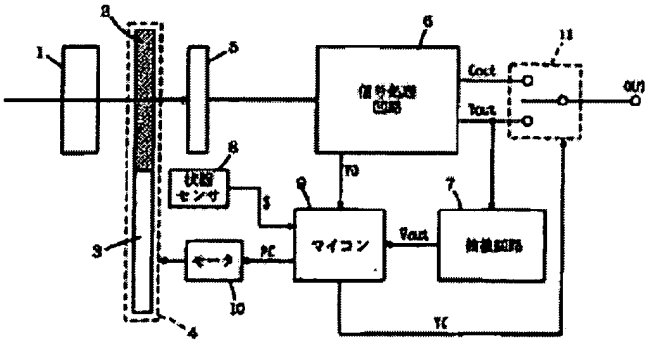
12 Luminance Sensor

C_{out} Color signal (composite video signal)

Y_{out} Monochrome signal (luminance signal)

FC Filter change-over signal

[Figure 1]



6- Signal processing circuit

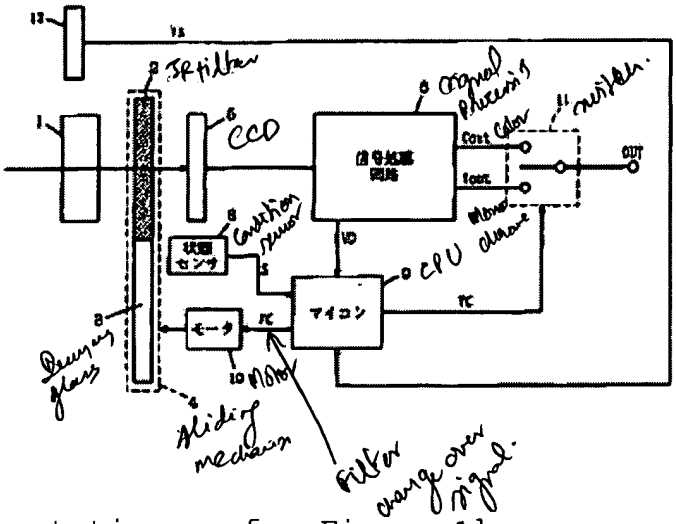
7- Detection Circuit

8- Condition sensor

9- Microcomputer

10- Motor

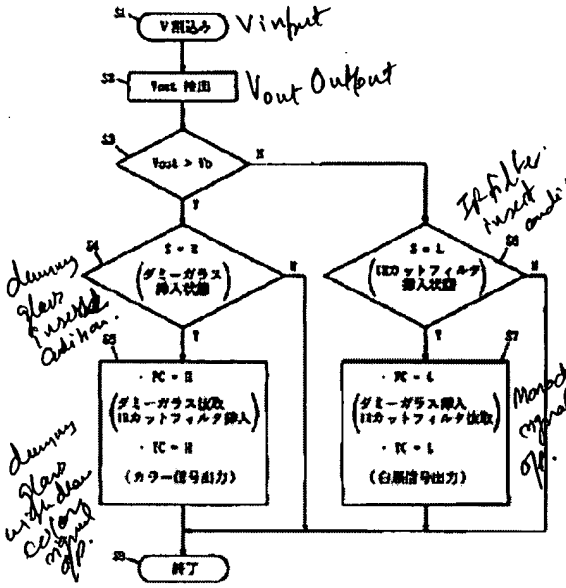
[Figure 3]



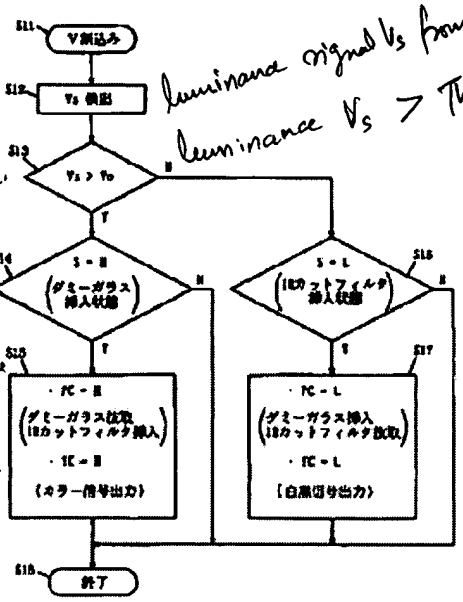
[Same notation as for Figure 1]

	Figure 2		Figure 4	
	S1	V input	S11	V input
	S2	V_{out} output	S12	V_S output
	S4	(dummy glass insert condition)	S14	(dummy glass insert condition)
	S5	(dummy glass withdraw; color signal output	S15	(dummy glass withdraw; infrared cut filter insert) (color signal output)
	S6	Infrared cut filter insert condition	S16	(infrared cut filter insert condition)
	S7	Monochrome signal output	S17	(dummy glass insert; infrared cut filter insert) Monochrome signal output

【図2】


S1
V読込み
Vinput
S2
Vout 検出
Vout Output
S3
Vout > Vb
N
Y
S4
S = H
(ダミーガラス挿入状態)
N
Y
S5
・IC = H
(ダミーガラス状態
IRカットフィルタ挿入)
・IC = H
(カラー信号出力)
S6
S = L
(IRカットフィルタ挿入状態)
N
Y
S7
・IC = L
(ダミーガラス挿入
IRカットフィルタ抜取)
・IC = L
(白黒信号出力)
S8
終了

【図4】


S11
V読込み
S12
Vs 検出
S13
Vs > Vb
N
Y
S14
S = H
(ダミーガラス挿入状態)
N
Y
S15
・IC = H
(ダミーガラス状態
IRカットフィルタ挿入)
・IC = H
(カラー信号出力)
S16
S = L
(IRカットフィルタ挿入状態)
N
Y
S17
・IC = L
(ダミーガラス挿入
IRカットフィルタ抜取)
・IC = L
(白黒信号出力)
S18
終了